

CLAIMS

- 1 1. In a data network comprising a plurality of nodes, a method for transferring data
2 packets between a source node and a destination node contained in the network, wherein
3 the source node and destination node belong to the same virtual-local-area network
4 (VLAN), the method comprising the steps of:
5 establishing a virtual port associated with the destination node and a connection
6 associated with the virtual port and the VLAN;
7 acquiring a data packet from the source node, wherein the packet is associated
8 with the VLAN and contains a destination address associated with the destination node;
9 and
10 transferring the packet to the destination node over the connection via the virtual
11 port.
- 1 2. A method as defined in claim 1 comprising the step of:
2 applying a port identifier (ID) associated with the virtual port to an interface de-
3 scriptor block (IDB) database to identify an IDB database entry associated with the vir-
4 tual port.
- 1 3. A method as defined in claim 2 wherein the identified IDB database entry con-
2 tains a VLAN ID that represents the VLAN associated with the packet.
- 1 4. A method as defined in claim 1 wherein the packet contains a VLAN ID that rep-
2 resents the VLAN associated with the packet.
- 1 5. A method as defined in claim 1 comprising the steps of:
2 applying the destination address contained in the packet and a VLAN ID that
3 identifies the VLAN associated with the packet to a forwarding database to locate a for-
4 warding database entry that contains (i) a destination address that matches the destination
5 address contained in the packet and (ii) a VLAN ID that matches the VLAN ID that
6 identifies the VLAN associated with the packet; and

7 identifying a virtual port associated with the destination node using a port identi-
8 fier contained in the matching forwarding database entry.

1 6. A method as defined in claim 1 comprising the steps of:
2 applying a port identifier (ID) associated with the virtual port to an interface de-
3 scriptor block (IDB) database to identify an IDB database entry associated with the vir-
4 tual port;
5 locating a virtual port (VPORT) VLAN database using an address contained in
6 the IDB database entry;
7 applying a VLAN ID that identifies the VLAN associated with the packet to the
8 VPORT VLAN database to locate a VPORT VLAN database entry that contains a VLAN
9 ID that matches the VLAN ID that identifies the VLAN associated with the packet;
10 encapsulating the packet; and
11 transferring the encapsulated packet over a connection identified by a connection
12 ID contained in the matching VPORT VLAN database entry.

1 7. A method as defined in claim 6 wherein the packet is encapsulated in accordance
2 with the Institute of Electrical and Electronics Engineers (IEEE) 802.1Q standard.

1 8. A method as defined in claim 6 comprising the steps of:
2 acquiring the encapsulated packet;
3 decapsulating the acquired encapsulated packet to yield the original packet;
4 applying the destination address contained in the original packet to an address
5 translation database to determine if the destination address matches an internal address
6 contained in an entry in the database; and
7 if so, replacing the destination address in the original packet with an external ad-
8 dress contained in the matching entry.

1 9. A method as defined in claim 1 wherein the connection is a point-to-point proto-
2 col (PPP) connection.

- 1 10. A method as defined in claim 1 wherein the connection is an Asynchronous
2 Transfer Mode (ATM) virtual connection (VC).
- 1 11. A method as defined in claim 1 wherein the connection is a frame relay connec-
2 tion.
- 1 12. A method as defined in claim 1 wherein the connection is a trunked connection.
- 1 13. A method as defined in claim 1 wherein the connection is associated with a con-
2 nection identifier (ID).
- 1 14. A method as defined in claim 13 comprising the step of:
2 identifying an entry in a VLAN ID database that contains a virtual connection
3 (VC) ID that matches the connection ID.
- 1 15. A method as defined in claim 13 comprising the steps of:
2 acquiring an encapsulated packet on the connection;
3 identifying an internal VLAN ID associated with the connection's ID; and
4 doubly encapsulating the encapsulated packet wherein the doubly encapsulated
5 packet contains the internal VLAN ID.
- 1 16. A method as defined in claim 15 wherein the doubly encapsulated packet is en-
2 capsulated in accordance with the Institute of Electrical and Electronics Engineers (IEEE)
3 802.1Q standard.
- 1 17. A method as defined in claim 15 comprising the steps of:
2 applying a destination address contained in the doubly encapsulated packet to an
3 address translation database to determine if the destination address matches an external
4 address contained in an entry in the address translation database; and
5 if so, replacing the destination address contained in the doubly encapsulated
6 packet with an internal address contained in the matching entry.

1 18. In a data network comprising a plurality of nodes, a method for transferring data
2 packets between a source node and a destination node contained in the network, wherein
3 the source node and destination node belong to the same virtual-local-area network
4 (VLAN), the method comprising the steps of:

5 generating a data packet at the source node, wherein the data packet contains a
6 destination address associated with the destination node;

7 transferring the packet to a source intermediate node contained in the network;

8 at the source intermediate node, (i) acquiring the packet, (ii) identifying a VLAN
9 associated with the packet, (iii) identifying a virtual port through which the destination
10 node may be reached, (iv) identifying a connection that is associated with the virtual port
11 and the packet's VLAN, and (v) transferring the packet over the connection via the vir-
12 tual port to a destination intermediate node contained in the network; and

13 at the destination intermediate node, (i) acquiring the packet, (ii) identifying a port
14 through which the destination node may be reached and (iii) forwarding the acquired
15 packet to the destination node.

1 19. A method as defined in claim 18 comprising the step of:

2 at the source intermediate node, encapsulating the packet.

1 20. A method as defined in claim 19 wherein the packet is encapsulated in accordance
2 with the Institute of Electrical and Electronics Engineers (IEEE) 802.1Q standard.

1 21. A method as defined in claim 18 wherein the connection is a point-to-point proto-
2 col (PPP) connection.

1 22. A method as defined in claim 18 wherein the connection is an Asynchronous
2 Transfer Mode (ATM) virtual connection (VC).

1 23. A method as defined in claim 18 wherein the connection is a frame relay connec-
2 tion.

1 24. A method as defined in claim 18 wherein the connection is a trunked connection.

1 25. An intermediate node comprising:

2 a line card coupled to a network wherein the line card is configured to acquire
3 data packets containing destination addresses; and

4 a processor configured to (i) establish one or more virtual ports wherein each vir-
5 tual port is associated with one or more connections and each connection is associated
6 with a virtual-local-area network (VLAN), (ii) associate an acquired packet with a
7 VLAN, (iii) identify a virtual port associated with a destination address contained in the
8 acquired packet, (iv) identify a connection associated with the VLAN and (v) transfer the
9 packet over the connection via the virtual port.

1 26. An intermediate node as defined in claim 25 wherein the connections are a com-
2 bination of connection types.

1 27. A apparatus for transferring data packets between a source node and a destination
2 node contained in a data network, wherein the source node and destination node belong
3 to the same virtual-local-area network (VLAN), the apparatus comprising:

4 means for establishing a virtual port associated with the destination node and a
5 connection associated with the virtual port and the VLAN;

6 means for acquiring a data packet from the source node, wherein the packet is as-
7 sociated with the VLAN and contains a destination address associated with the destina-
8 tion node; and

9 means for transferring the packet to the destination node over the connection via
10 the virtual port.

1 28. A computer readable medium comprising computer executable instructions for
2 execution in a processor, the medium comprising instructions for:

3 establishing a virtual port that is associated with a destination node, contained in a
4 data network, and a connection associated with a virtual-local-area network (VLAN) and
5 the virtual port;
6 acquiring a data packet wherein the packet is associated with the VLAN and con-
7 tains a destination address associated with the destination node; and
8 transferring the packet to the destination node over the connection via the virtual
9 port.